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AUTHOR Gorrell, John Jeffrey
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ABSTRACT

The purpose of this educational research project is to assess whether teachers actually encourage and foster (invite) their elementary students to solve problems. Teacher invitations are verbal and nonverbal messages sent to students either intentionally or unintentionally. Teacher invitations are significant because they indicate the teacher's expectancy toward the student regarding problem-solving ability. Ten problem-solving behaviors were identified--taking a step-by-step approach to problems, working carefully, making many tries, developing plans for action, reviewing ways of getting information, generating specific alternatives, combining information into new forms, seeking the core of the problem, centering attention on the problem, and making sure the problem is understood. The method of discovering which teacher behaviors were most likely to foster these behaviors among students involved a three step process--(1) directing 46 public school teachers to rate teacher behaviors for their importance in promoting effective problem-solving behaviors in students, (2) preparing a 40-item self-report instrument to assess the degree to which a teacher invites problem solving in students, and (3) testing the validity of the test instrument. Findings indicated that there was a high degree of consistency among teachers regarding choice of behaviors which they identified as important for problem solving and that teachers were able to fairly well evaluate their own behavior regarding whether they encouraged problem solving among students to a high degree. Findings from a preliminary testing of the test instruments indicated that certain types of behaviors (including encouraging students to use their own ideas and paying attention to student responses) were quite powerful in discriminating between teachers who effectively invite problem solving and those who do not. The conclusion is that there are specific behaviors which may serve to assess the degree to which teachers invite problem solving in students. Additional research is suggested. (DB)

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INVITING PROBLEM-SOLVING IN UPPER ELEMENTARY STUDENTS: STEPS TOWARDS ISOLATING AND MEASURING TEACHER INVITATIONS

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By
John Jeffrey Gorell
Southeastern Louisiana University

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Problem-solving is a highly complex process that integrates within one individual attained concepts, generalizable knowledge, and fluid problem-solving skills. Problem-solving may be applied to academic, social, physical, political, scientific, and personal problems. It is certainly not limited to specific subjects, nor should it be characterized as being the province of certain areas of knowledge. In fact, problem-solving represents the good intellectual skills and habits which include "curiosity, inquiry, persistence and carefulness" (Bigge and Hunt, 1980, p. 482) in decision-making of all types. Unfortunately, most individuals adopt strategies of decision-making that fail to account for all the relevant procedures in solving problems. In such instances, they habitually act on the basis of untested assumptions, ignore important information, seek simplistic solutions to complex problems, or otherwise deviate from sound problem-solving methodology. Problem-solving, therefore, needs to be encouraged on both the skills level and on the predisposition level.

Research on problem-solving skills training focuses upon attempts to increase the efficiency with which one solves problems or upon strategies to reduce or eliminate unproductive, habitual, mental "sets" that may interfere with the generation of workable solutions (Dubois, Alberson, and Staley, 1979). A combination of

both approaches appears to be quite productive, especially if the problem-solving instruction is related to the intellectual demands of the subjects which employ it.

The teaching of systematic, logical analysis is of primary importance in most problem-solving programs. Yet success will certainly be mediated by many other factors, such as intellectual maturity, cognitive style, specific experiences, related training, achievement motivation, positive conditioning, and parental modeling. It appears that IQ (Carmichael, 1979), impulsivity (Zelniker and Jeffrey, 1976; Cameron, 1976), awareness of one's performance (Bertsfai and Zaknarova, 1975), acceptance of responsibility (Thomas, 1980), anxiety level (Dubois, et al. 1979), and internal locus of control orientation (Thomas, 1980) influence a child's level of performance on problem-solving tasks. These characteristics, however, are capable of being modified through experience and may be enhanced through problem-solving training. This has been pointed out by Schunke and Hoffman:

> There are two types of awareness which can be developed. First, the students can be helped to know that there are systematic and logical ways of dealing with problems. They can be helped to see that there are a given set of steps which, although not always taken in the same sequence, can be used in working through a problem or making a decision. Secondly, the children can be assisted in seeing the practical validity of these ways of working (1980, p. 25).

For long range effects in problem-solving to be achieved, it is important to develop in students the habits, predilections, and styles of thinking (Bruner, 1968). Such predispositions are developed through positive experiences and social reinforcement. A pervasive, positive attitude toward problem-solving as a means of handling academic and personal issues can be engendered through the teacher's deliberately making systematic problem-solving inviting to the student.

A powerful influence upon a student's beliefs and behaviors is the teacher's expectancy toward the student (Rosenthal, 1958). Self-fulfilling prophecies have been well documented in educational literature (Good and Brophy, 1978), typically exhorting teachers to recognize and overcome the onerous effects of negative prophecies. On the other hand, many positive effects accrue because of positive expectations (Combs, Avila and Purkey, 1978; Ringness, 1975). A particularly complete theory regarding the effects of teacher expectations is W. W. Purkey's "Invitational Education" approach. Purkey (1978) characterizes teachers as sending, either intentionally or unintentionally, "invitations" to their students through verbal and nonverbal communication. These invitations serve as a form of unconditional positive regard, which encourages students to trust others, to develop a sense of control, to develop a willingness to try new experiences, and to meet school expectations. It follows

from Purkey's theory that invitations can be deliberately communicated throughout the daily routine of the classroom. It should also follow that teachers can direct their invitations towards certain desirable educational goals, such as problem-solving, reading, mastery of a body of knowledge, and developing a desire to learn.

How specifically, though, can the effects of the intended invitations be designated in advance? It is certainly possible to increase a student's level of self-esteem, achievement motivation, social adjustment, emotional well-being, etc. through consistent, positive interplay with the teacher. When a teacher sets out to develop a specific set of skills, however, the teacher has relatively precise expectations for student performance. Even if the teacher does not judge the students' mastery of such skills overtly, the teacher still is likely to be commited strongly to student progress. This means that it could be difficult to relate appropriate invitations without also imposing expectations regarding standards of achievement, leading to the eventual loss of the greatest value of the concept of invitations, the teacher's acceptance of the student's response, either positive or negative, to the invitations sent. This potential problem can be resolved, however, if the teacher uses invitations as adjuncts to the planned curriculum, so that they may enhance motivational level, interest, and self-confidence without confusing the students over what is required and what is desired.

Keeping in mind that invitations are most likely to be successful in developing appropriate attitudes and habits related to problem-solving, we can focus upon those behaviors that are affected by the student's level of motivation and preferences. Effective problem solvers exhibit a range of supportive behaviors that, when applied to personal, academic, or professional problems, lead to adequate solutions. The most important behaviors to be encouraged relate to a range of coping and asserting abilities. These behaviors include all of the following:

1. Taking a step-by-step approach to problems
2. Working carefully
3. Making many tries (persistence)
4. Developing plans for action
5. Reviewing ways of getting information
6. Generating specific alternatives
7. Combining information into new forms or relations
8. Seeking the core or root of the problem
9. Centering attention on the problem
10. Making sure they understand the problem.

Interest at this time centers upon fostering these behaviors in upper elementary school students, because they are beginning to reach a level of mental maturity in which the systematic use of logical analysis and perseverance are most likely to be affected directly by teachers. While the highest, most complex levels of problem-solving are unlikely to be attainable at these ages, the students certainly can be acquainted with the ways to go about problem-solving and can develop habits that will continue into later years.

If it is desirable to foster the behaviors listed above, it becomes necessary to discover what teacher

behaviors are most likely to make those behaviors inviting to students. The construction of a useful instrument for assessing inviting behaviors has been the goal of this study. While it is assumed that there are teacher invitations that indirectly may promote effective problem-solving by reducing student anxiety, by improving interpersonal relationships, by developing a higher level of self-esteem in the student, and by making learning in general more attractive, much greater concern has been directed towards the specific inviting behaviors that encourage students to assert themselves and to cope better with problems directly. Thus, preparation of a list of inviting behaviors has concentrated on a set of observable behaviors that should promote one or more of the ten behaviors of effective problem-solvers.

In the first step of the development of a suitable inventory, forty-six experienced public school teachers from the range of teaching levels were instructed to rate fifty-nine teacher behaviors, according to how important they believed these behaviors are in promoting effective problem-solving behaviors in students. They also were requested to list any other behaviors that they thought should be added to the list. The results of these ratings led to the preparation of a forty-item self-report instrument designed to assess the degree to which a teacher invites problem-solving in students. The second step involved the presentation of the current instrument to

thirty-three fourth through eighth grade teachers in order to test the validity of the individual items.

While this phase of the study is still in progress and more analysis of the data collected is necessary, some preliminary results are suggestive. The most interesting trends being highlighted at this time point to certain types of behaviors being quite powerful in discriminating between those teachers who effectively invite problem-solving and those who do not. The behaviors in which there is the greatest amount of deviation between high and low inviters point to a possible pattern.

Low inviters of problem-solving seem to be much more likely to ignore student responses that they consider irrelevant; to ask simple, fact questions, rather than more open-ended questions; to maintain a traditional classroom structure; to follow set patterns in instruction; and to encourage students to follow already established, tried-and-true methods of solving problems. The same group seems to be less likely to encourage students to become active, use their own ideas, and to engage in trial and error attempts; less likely to provide students with a variety of small group, large group and individual learning activities, and less likely to introduce interesting, curiosity-arousing learning activities.

On many of the other items in the instrument, we are finding quite a high level of agreement between the low and high inviters. Interestingly, five items, which

conceptually were considered to work against the development of effective problem-solving, seem to be strongly preferred by both high and low inviters. These items include encouraging students to stick to the facts when discussing a topic; leaving students alone when they are working steadily on tasks; pointing out underlying concepts and generalizations; and determining academic goals for students in advance. It may be that these behaviors are irrelevant to the direct fostering of problem-solving or that, as is more likely, the production of these behaviors provides the foundation for later advancement. This raises an issue that will be addressed in later phases of the project: does the provision of a basic level of structure and facticity in the classroom also invite students by giving them a sense of intellectual security upon which the effectiveness of other invitations depend? It may be that those teachers who consistently score higher on the scale provide all of the basic structure that the other teachers provide, but then go beyond that structure in order to encourage problem-solving in their students.

While the problem-solving invitations inventory is part of a long term research program designed to develop skills and attitudes in upper elementary school children, these initial results indicate that there are relatively specific behaviors that may serve to assess

the degree to which teachers invite problem-solving in students. The foregoing is merely a start towards development of clear guidelines for training teachers in the art of inviting their students.

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